

ECONOMIC ANALYSIS OF POST HARVEST LOSSES IN DIFFERENT MARKETING CHANNELS OF VEGETABLES IN MANDYA DISTRICT OF KARNATAKA STATE

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ABSTRACT

A study was taken up to assess the post harvest losses in different supply chains of vegetables for the period 2009-2010 in Mandya district of Karnataka State. Multistage sampling was adopted for the selection of respondents and 90 vegetable growers and 60 output suppliers were selected randomly. In case of selected vegetables three output supply chains were observed in study area. Supply Chains identified in vegetables were a) Farmer - Commission Agent 1 - Commission Agent 2 - Retailer - Consumer (SC-I), b) Farmer - Wholesaler - Retailer - Consumer (SC-II) and c) Farmer - Retailers - Consumer (SC-III). The SC-I and SC-II were followed by majority of the farmers in all vegetable crops under study. The reason to sell the produce to commission agents was that, the farmers were getting spot payments and competitive prices which is not followed by other agents like wholesalers and retailers. In case of all the vegetables, SC-III was the most efficient supply chain as the cost incurred on marketing expenses was least and marketing efficiency was highest. The maximum quantity of the produce in all the vegetables was routed through the SC-I. The physical losses were least in SC-III as compared to other supply chains. The per quintal losses were found to be maximum at producer's level ranging from 10.02 kg to 13.65 kg, 8.84 kg to 8.76 kg in tomato and brinjal crops, respectively.

KEYWORDS: Post Harvest Loss, Marketing Channels, Tomato, Beans, Brinjal

INTRODUCTION

In today's highly competitive global market, there is pressure on organizations to find new ways to create and deliver the goods. In this context, logistics and supply chain management are the crucial areas of management and have become national focus. Though, India spends over 12 per cent of its GDP on logistic and supply chain management, value provided to the customer is unsatisfactory. This area becomes even more important in the sector of agribusiness because most of the agricultural products are perishable and have a very short shelf life. Supply Chain Management (SCM) is the process of planning, implementing and controlling the operations of the supply chain with a purpose to satisfy customer requirements as efficiently as possible. It spans all movement and storage of raw materials, work-in-process inventory and finished goods from point-of-origin to point-of-consumption. Supply chain management involves coordinating and integrating these flows both within and among companies.

The concept of agriculture supply chain refers to the activities of procurement, order fulfillment, product design and development, distribution, delivery and customer service executed by two or more separate organizations in the agribusiness industry, to fulfill customer orders. Agriculture supply chain consists of small and medium enterprises, such as farmers and raw material producers, suppliers of agricultural inputs, processors of agricultural outputs, farmers'

co-operatives, brokers, suppliers, distributors, wholesalers and retailers that either tend to operate independently or in co-operation, mainly in the last stages of supply chain. An efficient supply chain can contribute to increase in the marketable surplus by lowering down the inefficiencies in production, processing, storage and transportation. It ensures better prices to the farmers which lead the farmers to invest more in agriculture. It widens market opportunities for products and thus helps in maintaining an ever increasing demand for the same.

At present, horticultural crops occupy around 10 per cent of India's gross cropped area. One of the most fundamental issues in horticulture, which actually require research, is the method by which we can minimize the post harvest losses, which is quite substantial at present. This needs the designing of efficient, cost effective and environment friendly supply chain systems. Hence, there is an importance for supply chain in improving marketing activities of horticultural crops. India is the second largest producer of fruits and vegetables with a production of 142.36 MT. But, due to inadequate cold storage, preservation facilities and improper supply chain infrastructure wastage of horticultural produce is high. This colossal post harvest waste of fruits and vegetables leads to instability of prices, farmers not getting remunerative prices, rural impoverishment culminating in farmer's frustrations and suicides. Enough attention has been paid at the pre-harvest stages for bolstering the levels of production by innovative techniques like crop rotation, soil conservation, pest control, fertilizers, irrigation, etc., but, post harvest issues have not been addressed adequately. Keeping, the above aspects in consideration the study was carried out with the objective to quantify the post harvest losses of vegetables in different supply chains.

METHODOLOGY

Since the study was aimed at finding out the supply chain management of vegetables, the sample comprised the selection of cultivators and market intermediaries for gathering the relevant data. Multistage random sampling technique was used to select respondents for the study. In the first stage, Mandya district of Karnataka state was purposively selected for the present study. In second stage, three taluks were selected purposively on the basis of maximum area under vegetables where as in third stage three villages from each taluks and 10 farmers from each village were selected randomly. Thus the data was collected from 90 farmers and 60 market intermediaries. The data were collected by survey method with the help of specially designed schedules.

RESULTS AND DISCUSSIONS

Vegetables Grown by Sample Cultivators

Different vegetables grown by the sample farmers are presented in the table 1. The results revealed that, at overall level the proportion of area under vegetables was maximum in *kharif* season (35.09%), followed by *rabi* season (33.38%) and summer season (31.53%). The area under selected vegetable (i.e. tomato, beans, and brinjal) was found to be higher (90.14%) than other vegetables (9.86%). The area under selected vegetables was 31.80 per cent, 30.09 per cent and 28.25 per cent, in *kharif*, *rabi* and *summer* season, respectively. Tomato occupied maximum area (12.55%) in *kharif* followed by beans (9.98%) and brinjal (9.27%).

Table 1: Per Farm Area under Different Vegetables Grown by the Sample Farmers (Area in ha)

S. No.	Particulars Season/Vegetables	Groups			
		Small (N=30)	Medium (N=30)	Large (N=30)	Overall (90)
1.	Kharif				
	a. Tomato	0.18 (14.40)	0.33 (11.26)	0.37 (12.67)	0.29 (12.02)
	b. Beans	0.10 (8.00)	0.28 (9.56)	0.32 (10.96)	0.23 (9.56)
	c. Brinjal	0.09 (7.20)	0.27 (9.22)	0.29 (9.93)	0.22 (8.88)
	d. Other vegetables	0.03 (2.40)	0.08 (2.73)	0.12 (4.11)	0.08 (3.14)
	Total	0.40 (32.00)	0.96 (32.76)	1.10 (37.67)	0.82 (33.61)
2.	Rabi (Irrigated)				
	a. Tomato	0.13 (10.40)	0.37 (12.63)	0.31 (10.62)	0.27 (11.07)
	b. Beans	0.12 (9.60)	0.26 (8.87)	0.31 (10.62)	0.23 (9.43)
	c. Brinjal	0.12 (9.60)	0.25 (8.53)	0.24 (8.22)	0.20 (8.33)
	d. Other vegetables	0.03 (2.40)	0.08 (2.73)	0.12 (4.11)	0.08 (3.14)
	Total	0.40 (32.00)	0.96 (32.76)	0.98 (35.56)	0.78 (31.97)
3.	Summer (Irrigated)				
	a. Tomato	0.21 (16.80)	0.42 (14.33)	0.27 (9.25)	0.30 (12.30)
	b. Beans	0.12 (9.60)	0.25 (8.53)	0.25 (8.56)	0.21 (8.47)
	c. Brinjal	0.09 (7.20)	0.26 (8.87)	0.20 (6.85)	0.18 (7.51)
	d. Other vegetables	0.03 (2.40)	0.08 (2.73)	0.12 (4.11)	0.08 (3.14)
	Total	0.45 (36.00)	1.01 (34.47)	0.84 (28.77)	0.77 (31.42)
	Grand vegetable area	1.25 (100.00)	2.93 (100.00)	2.92 (100.00)	2.44 (100.00)

Note: Figures in the parentheses are percentage to the gross vegetable area

Supply Chains of Selected Vegetables

Three vegetables were selected for the study such as Tomato, Beans and Brinjal. Three supply chains were observed for these vegetables in the study area. The Supply Chains identified in selected vegetables were a) Farmer - Commission Agent-1 - Commission Agent-2 - Retailer - Consumer (SUPPLY CHAIN-I), b) Farmer - Wholesaler - Retailer - Consumer (SUPPLY CHAIN-II) and c) Farmer - Retailers - Consumer (SUPPLY CHAIN-III).

Distribution of Sample Farmers According to Supply Chains

Distribution of sample farmers according to supply chains is given in Table 2. It is revealed that, the Supply Chain-I (Farmer - Commission Agent-1 - Commission Agent-2 - Retailer - Consumer) and Supply Chain-II (Farmer - Wholesaler - Retailer - Consumer) were followed by majority of the farmers in all vegetable crops under study.

Table 2: Distribution of Farmers According to Supply Chains

Sl. No.	Output Supply Chains	Vegetables		
		Tomato	Beans	Brinjal
1	Farmers - Commission Agent 1 - Commission Agent 2 - Retailer - Consumer (SUPPLY CHAIN-I)	45 (53.5)	42 (52.5)	42 (55.2)
2.	Farmers -Wholesaler - Retailer - Consumer (SUPPLY CHAIN-II)	31 (37)	31 (38.7)	28 (36.8)
3.	Farmers - Retailer - Consumer (SUPPLY CHAIN-III)	08 (9.5)	07 (8.7)	06 (7.8)
	Total	84 (100)	80 (100)	76 (100)
	Total Sample	90	90	90

Note: Figures in the parentheses are percentage to the total growers for respective crop.

Post Harvest Loses in Marketing of Vegetables

The post harvest losses in marketing of selected vegetables in identified Supply Chains were studied and it is

presented as follows.

Per Quintal Post Harvest Losses in Different Supply Chains of Tomato: The per quintal Post harvest losses in different supply chains in tomato crop were estimated and presented in table 3.

Table 3: Per Quintal Post Harvest Losses in Different Supply Chains of Tomato (Quantity in kg.)

S. No.	Particulars	Marketing Channels		
		Supply Chain-I (45)	Supply Chain-II (32)	Supply Chain-III (07)
1.	At farm level			
	a. During harvesting	1.17	1.34	1.1
	b. Grading	5.13	4.97	4.06
	c. During Packaging	3.66	3.79	3.43
	d. During transportation	3.69	2.90	1.43
	Total (kg)	13.65	13.00	10.02
2.	At Commission Agent's Level			
	a. Grading	2.82	-	-
	b. During Packaging	2.18	-	-
	c. During transportation	3.06	-	-
	Total (kg)	8.06	-	-
3.	At wholesaler's level			
	a. Grading	2.46	4.21	-
	b. During Packaging	1.53	2.89	-
	c. During transportation	2.50	3.98	-
	Total (kg)	6.49	11.08	-
4.	At retailer level			
	a. Grading	2.82	4.72	5.38
	Total (kg)	2.82	4.72	5.38
	Per Quintal Total Losses (kg)	31.02	28.80	15.40

It was observed from table that, per quintal losses in different supply chains were 15.40/q in supply chain -III, 28.80 kg/q in supply chain -II and 31.02 kg/q in supply chain-I. In supply chain-I, losses were maximum at farm level (13.65 kg/q) followed by losses at commission agent's level (8.06 kg/q) and at wholesaler's level (6.49/q). In supply chain-II, the losses were found to be maximum at farm level (13 kg/q) followed by wholesaler's level (11.08 kg/q). In case of supply chain-III losses were maximum at farm level (10.02 kg/q). Among all agencies of marketing, it was found that losses at farm level were maximum in all supply chains ranging from 10.02 kg/q in supply chain-III to 13.65 kg/q in supply chain-I. The losses were minimum in supply chain-I at retailer's level (2.82 kg/q) than other supply chains and intermediaries because of more grading followed and among different supply chains per quintal losses were minimum in supply chain-III (15.40 kg/q). The losses in supply chain-I and supply chain-II were higher due to the higher number intermediaries.

Per quintal Post Harvest Losses in different Supply Chains of Beans: The per quintal Post harvest losses in different supply chains in beans crop were estimated in Table 4.

Table 4: Per Quintal Post Harvest Losses in Different Supply Chains of Beans (Quantity in kg.)

Sl. No.	Particulars	Marketing Channels		
		Supply Chain-I (45)	Supply Chain-II (32)	Supply Chain-III (07)
1.	At farm level			
	a. During harvesting	0.85	0.77	0.81
	b. Grading	1.83	1.92	1.71
	c. During Packaging	0.86	1.22	1.37
	d. During transportation	1.21	1.07	0.93
	Total (kg)	4.75	4.98	4.82
2.	At commission agent's level			
	a. Grading	1.25	-	-
	b. During Packaging	3.29	-	-
	c. During transportation	1.48	-	-
	Total (kg)	6.02	-	-
3.	At wholesaler's level			
	a. Grading	0.99	1.26	-
	b. During Packaging	0.58	1.43	-
	c. During transportation	2.03	1.89	-
	Total (kg)	3.6	4.58	-
4.	At retailer level			
	a. Grading	1.95	2.26	4.79
	Total (kg)	1.95	2.26	4.79
	Per Quintal Total losses (kg)	16.32	11.82	9.61

It is observed from Table 4 that, the total losses during different operations in supply chains were to the tune of 16.32 kg/q, 12.36 kg/q and 9.61 kg/q in supply chain-I, supply chain-II and supply chain-III, respectively. In supply chain-I maximum losses were found to be 4.75 kg/q at farm level followed by at commission agent's level (6.02 kg/q) and at wholesaler's level (3.6 kg/q). In supply chain-II the losses were found to be more at farm level (4.95 kg/q) and at wholesaler's level (4.58 kg/q). In supply chain-III maximum losses were at retailer's level (4.79 kg/q) followed by farm level (4.82 kg/q). It was observed that the losses were less at retailer level in supply chain-I (1.95 kg/q), supply chain-II (2.26 kg/q) and supply chain-III (4.79 kg/q). The losses in supply chain-I and supply chain-II were higher due to the higher number intermediaries.

Per Quintal Post Harvest Losses in Different Supply Chains of Brinjal

The per quintal Post harvest losses in different supply chains in brinjal crop were estimated and presented in Table 5. It was revealed from table that, the per quintal losses in different supply chains were 13.25/q in supply chain-III, 19.36 kg/q in supply chain-II and 21.62 kg/q in supply chain-I. In supply chain-I losses were maximum at farm level (8.84 kg/q) followed by at commission agent's level (5.29 kg/q) and at wholesaler's level (4.82/q). In supply chain -II, the losses were found to be maximum at farm level (7.88 kg/q) followed by at wholesaler's level (7.87 kg/q). In supply chain-III, losses were maximum at farm level (8.76 kg/q). Among all agencies it was found that losses at farm level were maximum in all supply chains of brinjal which ranges from 7.88 kg/q in supply chain-II to 8.84 kg/q in supply chain-I. The losses were minimum at retailer's level in supply chain-I with 2.67 kg/q than at other supply chains.

Table 5: Per Quintal Post Harvest Losses in Different Supply Chains of Brinjal (Qty in kg.)

Sl. No.	Particulars	Marketing Channels		
		Supply Chain-I (45)	Supply Chain-II (32)	Supply Chain-III (07)
1.	At farm level			
	a. During harvesting	1.22	1.15	1.98
	b. Grading	3.06	2.94	3.28
	c. During Packaging	1.93	1.66	1.29
	d. During transportation	2.62	2.14	2.21
	Total (kg)	8.84	7.88	8.76
2.	At commission agent's level			
	a. Grading	2.60	-	-
	b. During Packaging	1.23	-	-
	c. During transportation	1.46	-	-
	Total (kg)	5.29	-	-
3.	At wholesaler's level			
	a. Grading	2.09	3.24	-
	b. During Packaging	1.17	1.57	-
	c. During transportation	1.56	3.06	-
	Total (kg)	4.82	7.87	-
4.	At retailer level			
	a. Grading	2.67	3.61	7.48
	Total (kg)	2.67	3.61	7.48
	Per Quintal Total Losses (kg)	21.62	19.36	16.24

SUMMARY AND CONCLUSIONS

The post harvest losses in tomato, brinjal and beans was highest in supply chain-I with 31.02 per cent, 21.62 per cent and 16.32 per cent, respectively. This may be attributed to the involvement of maximum number of intermediaries. Irrespective of the supply chain followed, the maximum percentage of post harvest losses was found in the tomato followed by brinjal and beans. So, the post harvest management of vegetables at farm level needs a lot of improvement on various fronts including grading, packing, storage and transportation of the produce to avoid the post harvest losses. The agricultural extension system should be integrated with marketing extension system to transfer post-harvest technology to the vegetable growers, which will definitely help to optimize post harvest management practices at farm level, reduction in the post harvest losses and overall cost will be substantially curtailed.

REFERENCES

1. Gajanana, T. M, Shreenivasa Murthy D., Sudha M. and Dakshinamurthy V. (2006). Marketing and estimation of post harvest losses of tomato crop in Karnataka. *Ind. J. Agril. Mktg.*, **20**(1): 1-11.
2. Kumar, K. D., Basavaraja H. and Mahajanshetty (2006). An Economic analysis of Post-harvest losses in vegetables on Karnataka. *Ind. J. Agril. Econ.*, **61**(1): 134-146.
3. Kumar, N. R., Pandey N. K. and Rana R. K. (2008). Marketing and post-harvest losses in cabbage and cauliflower in West Bengal. *Ind. J. Agril. Mktg.*, **22**(3): 11-37.
4. Sharma M. and Ranveer Singh (2008). Post harvest losses in fruits and vegetables in Himachal Pradesh. *Ind. J. Agril. Mktg.*, **22**(1): 13-24.